

having covered it with a blanket, and places it either on a tree near or under the eaves of his house, or in any adjoining place. Each man keeps pots varying in number from one to four. He need not do anything beyond keeping the pots as aforesaid. They store honey between April 15 and June 15; and between the latter date and the end of July the keeper gathers it in, leaving a small portion to serve as food for the bees."

Mr. R. Morgan, Deputy Conservator of Forests, Madras, gives an interesting account of the honey-bees of the Wynaad. He says that the best honey-producing flower of Southern India is the *Strobilanthes*, of which there are numerous species, which almost all flower once in seven years, dying down entirely, and afterwards a fresh growth springing up from seed. The *Strobilanthes* is a shrubby genus of *Acanthaceæ*, mostly with blue or purple flowers, and the statement about their flowering only once in seven years is probably a popular delusion, like that of the *Aloe* flowering once in a century. The bees build their combs on the ledges of inaccessible precipices, often overhanging rivers, or on lofty horizontal limbs of the largest forest trees, and the combs are usually $3\frac{1}{2}$ to 4 feet in length and 2 feet in diameter. The natives take the honey on dark nights by means of long cane or bamboo ladders, either erected against the tree or rock or suspended from above, and they carry torches, and knives to cut away the combs. The bees are roused by the glare of the torches, but do not sting, although in the daytime they are terribly pugnacious, and many a sportsman and traveller has barely escaped with his life after disturbing them. Mr. Morgan states that he can give numerous instances of men, cattle, horses, and even fowls and pigeons being killed by these bees.

The Deputy Conservator of Forests, East Salween, describes some remarkably large combs, one of which was 7 feet long and 6 feet deep in the widest part. The bees are fond of particular trees, and he states that on one *Kanyin* tree (*Dipterocarpus alatus*) he counted no less than thirty-nine combs, some of prodigious size. The trees are here ascended by means of pegs driven in the trunk, as in Borneo, and the bees are partially stupefied by a smoke torch.

These are samples of the better kind of reports that have been obtained from hundreds of districts in India. There is a monotonous similarity in large numbers of them, and it may be doubted whether the information afforded is worth the labour and cost it has entailed.

Mr. Harris's little volume on "The Honey-Bee" affords a striking contrast to the preceding work, both in its elegant get-up and excellent illustrations, its wide range of matter, and the clearness and condensation of its style. It treats in a pleasant and well-informed manner not only of bee-keeping but of the bees themselves and all that relates to them. We have a chapter on the literature of bees, from the Egyptian monuments and the Vedas to Shakespeare, Huber, and modern writers. Each subject is treated in a separate short chapter, so that we have chapters on "The Queen Bee," "The Workers," "Wax," "Bee-bread," &c., and even one on "Mead," including its use in ancient times and Queen Elizabeth's receipt for its manufacture. Hives, the Enemies, and the Diseases of Bees are all separately treated, as well as their "Intel-

lect and Instinct," their "Relation to Flowers," and the "Superstitions connected with Bees."

From so condensed a work it is difficult to find passages suitable for extract, but the following illustration of the powers of intellect manifested by bees may be taken as a fair specimen of the author's style:—

"Again, let us revert to the manufacture of queens by the workers. If at the time of the removal or loss of the mother-bee in any way, there should be unhatched princesses in the hive, no attempt will be made to follow the course adopted in the absence of such royal progeny. In the latter case—that is, when there is no royal brood—there must be a distinct conception, first, of their bereavement; secondly, of the hopelessness of a sovereign appearing in the ordinary way. Then a judgment is formed of the proceedings necessary for making a queen, and action immediately follows. Not only so, but as if to secure themselves against the repetition of their calamity, they prepare not *one* queen, but *several*, so that, if the first which comes to maturity be lost, there may be others in reserve. A further act of definite judgment appears in this; for if one only were produced and lost, they would be powerless to repeat the process, as all the rest of the worker brood would, in the meantime, have advanced far beyond the stage at which its transformation would be possible. The bees then, with admirable prevision, forbear to risk all the future of their community on one hope of a queen."

In adducing the construction of the cells as a proof of pure instinct of the highest order, Mr. Harris is hardly on secure ground, since he omits to notice the researches of Mr. Darwin proving that the method of cell-building is very simple, and consists, fundamentally, in forming circular cells the size of which is determined by that of the bee's body, and gnawing away all the superfluous wax in the angles till the hexagonal form is produced. He is also hardly justified in the statement that "all these and other circumstances connected with the construction of their dwellings attest the possession of an innate faculty *needing no instruction from the elders of the hive*." The last statement (which we have italicised) is surely unprovable, and as every young bee necessarily begins work in the midst of her elders, and has done so during the countless generations of the past, it seems more probable that a considerable portion, though not perhaps the whole, of the bees' wonderful constructive power, is due to direct imitation and instruction.

On the whole, we can recommend this little book as a very comprehensive summary of what is known about bees and bee-keeping, at once attractive to the young who wish to learn something about these marvellous little creatures, and at the same time containing all the information necessary for the beginner in apiculture. The illustrations are both well chosen and beautifully executed, and the work is altogether so daintily got up as to render it especially suited for a gift to intelligent boys and girls.

A. R. W.

DR. KLEIN ON MICRO-ORGANISMS
Micro-Organisms and Disease. By E. Klein, M.D.,
F.R.S. (London: Macmillan and Co., 1884.)

THERE can be no doubt of the value and excellence of this little book. Dr. Klein is one of the very few men in this country who are continually working and experimenting with Bacteria and similar forms. His

instructions and advice as to methods of study are invaluable, and his opinions on the numerous debatable questions connected with micro-organisms entitled to the highest respect. Dr. Klein has descended, as it were, from his position of experimentalist and observer, in order to place before the scientific public in a compact form a *résumé* of what is known at this moment concerning disease-producing micro-organisms. He classifies these organisms as Micrococci, Bacteria, Bacilli, Vibriones, Spirobacteria, Yeast-fungi, and Mould-fungi, and gives *seriatim* under each head, accompanied by numerous figures, often original, an account of such forms as have been found in association with disease. He refers the reader to the original writings in which this or that organism has been described, and whilst he sometimes judiciously throws doubt on a claim to pathogenic powers, he is entirely relieved from the responsibility of a critic in all cases by the disclaimer in his preface and by the fact that he obviously intends to leave the question in most cases to further inquiry. As an illustrated catalogue of reputed pathogenic Schizophytes, with references to original authorities, the work is invaluable.

At the same time Dr. Klein does, as so ripe a student of these questions must, commit [himself to very definite opinions on some of the great problems of what it is convenient to term "Bacteriology." Dr. Klein clings to the belief that speaking broadly the forms known as Micrococci, Bacteria, Bacilli, Vibriones, and Spirilla breed true and are to be recognised as true genera. This opinion is traceable to the fact that his studies have been chiefly (like those of Koch, who holds a similar view) carried out on parasitic (*i.e.* pathogenic) Schizophytes. And it is highly probable that it is more difficult (in some cases impossible) to break down the specific form by change of environment of a parasitic Schizophyte than of free-living kinds. But Dr. Klein has himself shown (p. 109) that *Bacillus* (*B. anthracis*) when cultivated in a certain way becomes *Micrococcus* (torula-form), and other similar instances are to be found in his book. Had he dealt with free-living Schizophytes as well as parasitic ones, he would have found ample evidence of the transformation, in the course of growth and division, of Micrococci into Bacteria, of these into Bacilli, and of these into Vibriones and Spirilla, and of each of these directly or indirectly into the other forms. The instability of the forms presented by particular kinds of Bacteria does not however imply, as has been assumed by some writers (Billroth *e.g.*), that there is only one "species" of Schizophyte. Such use of terms would lead to the statement that there is only one "species" of organism in all creation. The instability of the forms of Schizophytes merely implies that the range of presently observable specific characters taken as a whole (which forms the true limits of what mankind at the moment calls a "species") is *not* simply and directly coincident with the range of one particular and readily observed set of characters, namely, those of form. A great deal more depends upon the question of transmutability of the forms of Schizophytes than is admitted, at present, by pathologists. We would merely warn them that the doctrine of fixity of the forms of pathogenic Schizophytes is as much an *assumption* and as much to be received with caution as is the contrary doctrine of the universal transmutability of such forms. One great

fact is certain, viz. that *some* Schizophytes do exhibit the *positive* evidence of change of form in the course of growth under varying conditions.

Dr. Klein has a most interesting chapter on the conversion of innocuous into pathogenic organisms and *vice versa*, in which he criticises with great ability the results of Buchner and Nägeli on the one hand, and of Pasteur on the other. Valuable as such critical dissertations are, Dr. Klein will agree with us in thinking his experiments of greater value. We should be sorry were the test-experiments which they suggest to be delayed in consequence of the apparently satisfactory character of the reasonings which he and others have very properly adduced. The fact is that the proportion of what we know by careful experiment and observation in reference to Bacteria and their allies—as compared with what we must soon know and can see how to know if only time and ability are directed to the research—is so small that conclusions and generalisations are not useful except as suggestions to those who are in the thick of the work. More experiment, more trial of every conceivable condition of growth and nutrition, applied to every kind of Schizophyte observed and yet to be discovered, is imperatively called for.

Who can say that much is known as yet about these organisms, when even so earnest a student of them as Dr. Robert Koch did not know that his so-called "cholera comma-Bacillus" occurs in the mouths of nearly every healthy man, woman, and child?

Dr. Klein has rendered a generous service to future students of Bacteria by the publication of this little book. The woodcuts are very abundant, and sufficient to give an idea of the forms as they appear when stained by coloured reagents. The botanical and chemical aspects of the Schizophytes are necessarily not dealt with in this treatise.

E. RAY LANKESTER

OUR BOOK SHELF

A New Method of treating Glaucoma, based on recent researches into its Pathology. By Geo. Lindsay Johnson, M.A., M.B., B.C. Cantab. (H. K. Lewis, 1884.)

THIS little *brochure* is written by a Cambridge graduate who has devoted considerable time and attention to the study of diseases of the eye, and who has devised a new and very serviceable form of ophthalmoscope. The proposition he endeavours to establish is "that the ordinary method of treatment for glaucoma by iridectomy, though highly successful in acute forms of the disease, is nevertheless both uncertain and unsatisfactory in the chronic condition of glaucoma." The truth of this proposition all those who have had large experience in the performance of operations on the eye will freely admit: the reason is less easy to give. Dr. Johnson describes the lymphatic system of the eye, and adduces evidence to show that the aqueous humour is secreted by the ciliary processes and posterior surface of the iris, whilst it is drained off by the canal of Fontana, and the meshwork at the corneo-iridal angle. Any circumstance obliterating this angle is apt to induce glaucoma. It is certainly not due to swellings of the lens, since Brailey has shown that the lens is smaller in the glaucomatous than in the normal eye, but Dr. Johnson thinks that acute glaucoma may be referred to swelling and inflammation of the ciliary processes, whilst in chronic glaucoma there are slow and gradual changes in the ciliary body and in the lesions around the angle of the anterior chamber, which in his opinion explains the